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*Original Research*

# How does the obstetric anesthesia in cesarean section affect the wellbeing of the newborn?

Obstetric anesthesia and wellbeing of the newborn

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**Abstract**
Aim: The well-being of newborns after a cesarean section (CS) is the main important point when choosing anesthetic methods. APGAR score, cord blood gas levels, and early feeding of the newborns after CS are indicators of the newborn's well-being.
In this study, it was aimed to evaluate the effects of different anesthesia methods (regional and general) on Apgar score and cord blood gas, and the second aim is to evaluate the onset time of breastfeeding after CS with different anesthesia methods.
Material and Methods: A total of 364 mothers who underwent CS in our hospital, between January 2020 and April 2020 and their newborns' records were evaluated retrospectively.
Results: General anesthesia(GA), regional anesthesia (RA) anesthesia were applied during CS to 50% (n = 182), 50% (n = 182). There were no significant differences between the two groups (all p>0.05) in terms of APGAR score, umbilical cord arterial blood gas. The rate of breastfeeding in the first hour in the RA group was significantly higher than in the GA group (p <0.001).
Discussion: Two anesthesia (RA and GA) methods could be preferred safely for newborns in terms of APGAR score and umbilical cord blood gas, however, the timing of breastfeeding initiation was earlier with RA than GA.

**Keywords**
General anesthesia; Regional anesthesia; APGAR score; Cord blood gas; Early breastfeeding

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## Introduction

Cesarean section (CS) rate has increased over the past 30 years, despite the recommendation of the World Health Organisation (WHO) (Statement on Caesarean Section Rates, 2015 report) about the acceptable rate for CS to be between 10-15% because the pregnants prefer to be comfortable during the delivery process. In this case, the ideal method of anesthesia for CS has become controversial. Obstetric anesthesia targets to provide the mother's safety and the comfort and wellbeing of the newborn. In elective CS, and even in the urgent CS, regional anesthesia (RA) is the preferred method. It is safe because it prevents failed tracheal intubation and hypoxemia, but also facilitates the mother's awareness, and early bonding with her baby, and provides analgesia [1]. Nevertheless, many pregnants still do not accept this way because of fears and contraindications to this method. [2]. The CS with general anesthesia (GA) was thought to lead to asphyxia of the newborn in the past; however, with the use of short-term anesthetics such as propofol, these effects of GA are diminished. This draws more attention to GA [3].

The newborns should be evaluated immediately after birth with an APGAR score, which was created by Dr. Virginia Apgar to assess the effects of obstetric anesthesia on newborns [4]. A low APGAR score, including APGAR score components (pulse rate, respiratory effort, grimace reflex, skin color, activity) are valuable to predict neonatal mortality [5].

The cord blood gas analysis shows oxygenation of the newborns and acid-base status. Both the cord blood gas analysis and APGAR score can accurately show the effect of anesthesia for the newborns [6].

Different anesthesia methods may also affect the timing of onset of lactation. It is considered that in (CS) operations with GA, awakening and recovery of mothers' cognitive functions are retarded, and consequently, the mother-infant communication and lactation are delayed [7].

In this study, it was aimed to evaluate the effects of different anesthesia methods (regional and general) on APGAR score and cord blood gas, as a result, on the well-being of the newborn. The second aim was to evaluate the time to onset of lactation after (CS) with different anesthesia methods.

## Material and Methods

A total of 364 mothers who underwent (CS) in a private hospital in Kayseri, Turkey between January 2020 and April 2020 and their newborns' records were retrospectively evaluated for this study. The demographic characteristics of mothers (age, parity, chronic diseases) and newborns (gestational age, birth weight, gender) were noted. Additionally, types of anesthesia methods of mothers, 1-5. minutes APGAR score, venous cord blood gas and the time of initiation of breastfeeding of the newborns were recorded.

According to the anesthesia management of mothers, two groups were created as follows: regional (RA) and general anesthesia (GA) groups. The exclusion criteria for mothers were chronic diseases, obstetric comorbidities and the reluctance of the mothers to participate in the study. Newborns with congenital anomalies were also excluded. The time of onset of lactation was assessed as <1 hour or >1 hour after the operation and compared between the RA and GA groups.

APGAR score at 1 and 5 minutes was assessed by the pediatrician after delivery based on 5 criteria such as pulse rate, respiratory effort, grimace reflex, skin color, and activity. A score of 7-10 was considered normal; 4- 6 was mild neonatal asphyxia; and ≤3 was severe asphyxia [8]. The APGAR scores of the two groups of newborns were compared.

The arterial cord blood gas analysis was performed using an analyzer immediately after delivery, and PCO2, HCO3, pH and SO2 were noted and compared.

As anesthesia techniques, propofol (3mg/kg), rocuronium (0,6 mg/kg) and desflurane were used for general anesthesia, and bupivacaine (8-12 mg according to height) and ephedrine (if hypotension occurs) were used for RA.

The study was approved by the Ethics Committee of Acıbadem University. (No: 2020-24/23).

SPSS (v20) program was used to analyze the data. The Shapiro-Wilk test was used to evaluate the compliance with a normal distribution, and it was found that the data were not suitable for normal distribution. Median, lowest and highest values (min-max) were preferred for displaying continuous data. The Mann-Whitney U test was used to compare the means of continuous data. Pearson's chi-square test was used for comparing categorical data. A $p < 0.05$ value was accepted as the limit of significance.

## Results

A total of 364 pregnants gave birth to 364 newborns in our hospital, of which 47.8% were primigravida and 52.2% were multigravida (the mothers who had multiple pregnancies were excluded). The mean age of the mothers was 24.4 years, and all had no chronic diseases. Among 364 babies included in the study, 187 (51.4%) were boys and 177 (48.6%) were girls. The median gestational age and weight of the newborns were found to be 38 weeks (30-42) and 3160 gr (1260 -4450 gr), respectively.

General anesthesia and regional anesthesia were applied during cesarean section to 50% (n = 182) and 50% (n = 182) of the study group, respectively. There were no significant differences between the two groups in terms of gestational age and weight. The median APGAR score at 1 minute after birth in the GA group was 9 (4, 9) and 9 (6-9) in the RA group while the median APGAR score at 5 minutes was 10 (6, 10) in the GA group and 10 (7-10) in the RA group. HCO3, pCO2, and pH levels of cord blood were normal in two groups. The median cord blood pH in the GA group was 7.36 (6.72-7.53) and in the RA group, pH was 7.35 (7.04-7.56). Some characteristics of the study group are given in Table1.

When the first breastfeeding time was evaluated according to the anesthesia type in the study group, it was found that 69.8% (n = 127) of the babies in the RA group were breastfed within the first hour, while this rate was 29.7% (n = 54) in the GA group.

No significant difference was found between the APGAR scores and cord blood gas of the newborns according to the types of anesthesia ($p > 0.05$ for each), although the rate of breastfeeding in the first hour in the RA group was significantly higher than in the GA group ($p < 0.001$) (Table 2).

**Table 1.** Main characteristics of the study group

| | |
|---|---|
| Sex<br>n (%) | |
| Male | 187 (%51.4) |
| Female | 177 (%48.6) |
| Type of anesteshia methods<br>n (%) | |
| Spinal | 182 (%50.0) |
| General | 182 (%50.0) |
| First onset time of breastfeeding,<br>n (%) | |
| <1 hour | 181 (% 49.7) |
| >1 hour | 183 (%50.3) |
| APGAR 1.min.<br>median (min-max) | 9 (4-9) |
| APGAR 5.min.<br>median (min-max) | 10 (6-10) |
| Gestational age,<br>median (min-max) | 38 (30-42) |
| Birth weight,<br>median (min-max) | 3160 (1260-4450) |
| Cord ph,<br>median (min-max) | 7.3 (6.7-7.5) |
| Cord CO2,<br>median (min-max) | 40.5 (12.7-77.2) |
| Cord HCO3,<br>median (min-max) | 21.1 (5.3-35.7) |

**Table 2.** Comparison of some characteristics of newborns according to the type of anesthesia

| | General Anesthesia | Regional Anesthesia | p |
|---|---|---|---|
| Sex,<br>n (%) | | | |
| Male | 100 (%54.9) | 87 (%47.8) | 0.173 |
| Female | 82 (%47.8) | 95 (%52.2) | |
| First onset time of breastfeeding<br>n (%) | | | |
| <1hour | 54 (%29.7) | 127 (%69.8) | <0.001 |
| > 1hour | 128 (%70.3) | 55 (%30.2) | |
| APGAR 1.min.<br>median (min-max) | 9 (4-9) | 9 (6-9) | 0.096 |
| APGAR 5.min.<br>median (min-max) | 10 (6-10) | 10 (7-10) | 0.144 |
| Gestational age,<br>median (min-max) | 38 (31-42) | 38 (30-41) | 0.601 |
| Birth weight,<br>median (min-max) | 3165 (1260-4350) | 3155 (1360-4450) | 0.865 |
| Cord ph,<br>median (min-max) | 7.36 (6.72-7.53) | 7.35 (7.04-7.56) | 0.900 |
| Cord CO2,<br>median (min-max) | 41.2 (17.7-64.1) | 39.6 (12.7-77.2) | 0.197 |
| Cord HCO3,<br>median (min-max) | 21.1 (5.3-35.7) | 21.0 (6.7-34.1) | 0.273 |

## Discussion

The choice of anesthesia in CS is determined by multiple factors, including the indication for the operative delivery, its urgency, patients' and obstetrician's preferences, and the skills of the anesthesiologist. Advantages of RA include less neonatal exposure to depressant drugs, decreased risk of maternal pulmonary aspiration, awakening of the mother at the birth of her child, and early onset of lactation [9]. In recent years, with the use of short-term anesthetics, the adverse effects of GA may be lower, and additionally, because of the mother's preference or contraindications of RA, GA is again becoming a favorable method. In our retrospective study, we evaluated 364 CS hospital records, in which GA and RA anesthesia was applied during CS to 50% (n = 182) of all participants.

The well-being of newborns after CS is the most important point when choosing anesthetic methods. APGAR score, cord blood gas levels, and early feeding of the newborns as soon as possible after CS are the indicators of the newborn's well-being. APGAR score test quickly and summarily evaluates the health of newborns immediately after birth and determines any emergency care needs. The APGAR scoring system consists of pulse rate, respiratory effort, skin color, activity and grimace reflex. The total APGAR score of 7-10 is normal, and a lower APGAR score shows a depressed vitality. Newborns are usually scored twice with APGAR score at the 1st and 5th minutes after birth. While the 1-minute APGAR score alert the pediatrician for emergency resuscitation, and the 5-minute score predicts the mortality and morbidities of the newborns [10]. RA is generally considered the best choice for CS because it is believed that RA is better than GA in terms of neonatal acid-base status and APGAR score, [2,4,11]. In contrast to these findings, in our study, there was no statistical difference between the GA and RA groups in terms of APGAR score (all p>0.05) (Table 2). The median APGAR score atthe 1st and 5th minutes after birth was 9 (4, 9), 10 (6, 10), respectively, in both groups. Similar to our finding, some studies also revealed that there was no difference between the two anesthetic methods in terms of APGAR score [6,12,13].

The arterial cord blood gas is currently known as an important indicator of neonatal oxygenation, acid-base status and it accurately reveals the effect of anesthesia on the fetus like APGAR score [14]. In the literature, RA was associated with significantly lower umbilical arterial pH than GA. This may be because of hypotension following RA that can decrease uteroplacental perfusion and produce fetal acidosis [6,15,16], although in some studies, GA was associated with lower pH values [17,18]. Edipoglu et al. [19] found that umbilical blood pH with GA is associated with lower pH values (7.20 for GA versus 7.29 for RA), although this difference was not statistically significant (p > 0.05). In our study, we also did not find a statistically significant difference in umbilical cord pH, and base excess (all p>0.05) [GA -pH:7.36 (6.72-7.53) versus RA pH: 7.35 (7.04-7.56) ]. In our study, there is no difference between the two methods in terms of both APGAR score and umbilical cord blood gas, this may stem from the fact that short-acting anesthetics are preferred for GA, and elective CS was the most common in our study.

Another important outcome for the fetus or the newborn's welfare with the anesthetic methods in CS is the early bounding of mothers and babies, as well as early initiation of breastfeeding. Breastfeeding has been undoubtedly the best choice of nutritional source for all newborns [20]. To start breastfeeding as early as after the delivery (especially within the first hour) is very important for future breastfeeding facilities [20], however, it can be affected by many conditions. As reported in many studies, although late initiation of breastfeeding by mothers is thought to be associated with the cesarean delivery type [21], the effect of the anesthesia type

is not fully known [22].When the time to start breastfeeding was evaluated according to the anesthesia type in our study group, 69.8% (n = 127) of the newborns in the RA group were breastfed within the first hour, while this rate was 29.7% (n = 54) in the GA group. In terms of the rate of breastfeeding in the first hour, in the RA group, it was significantly higher than in the GA group (p <0.001). Similar to our study, Kocaöz et al. reported that the percentage of women starting to breastfeed within the first hour after giving birth by cesarean under GA was lower than that of women who gave birth under RA [23]. In contrast to these findings, in a study from Turkey, mothers receiving GA and RA for cesarean delivery were similarly successful in breastfeeding in the immediate postpartum period (96% RA vs 89% GA) [7]. RA, which controls the postoperative pain, may be linked to a more successful breastfeeding and infant weight gain than GA.

With respect to limitations of our study, although not analyzed in our study, other clinical variables known to influence fetal outcomes during cesarean delivery should also be considered as surgical parameters such as the duration of surgery, and the interval from uterine incision to delivery, which are known to influence neonatal outcomes. The other limitation may be that the elective CS was the most common practice in our study that is why maternal and fetal hemodynamics were more stable than the urgent CS

The most important issue in obstetric anesthesia is that the mother is safe and comfortable, the newborn's vital functions are good and the early bounding of mothers and babies is ensured which leads to early initiation of breastfeeding. Based on the data of our study, two anesthesia methods (RA and GA) can be preferred safely for newborns in terms of APGAR score and umbilical cord blood gas, however, breastfeeding initiation time is better with RA than GA. Mothers who have undergone cesarean with GA should be supported by health care professionals to start early breastfeeding.

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***Scientific Responsibility Statement***

*The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.*

***Animal and human rights statement***

*All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.*

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***Conflict of interest***

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